Appendix C

GWSCREEN Output Files

OUTPUT FILE FOR PBF05 Co-60

TIME OF RUN 11:30:55.4
DATE OF RUN 06/21/96
INPUT FILE NAME: pbf05-co.par
OUTPUT FILE NAME: pbf05-co.out
===

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment   *
    *   of the groundwater pathway from the leaching   *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds   *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit   *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-05 Co-60

SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:2 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   1.69E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   1.69E+01
THICKNESS OF SOURCE (m)   1.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   4.87E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   6.00E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   6.00E+01

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)           0.00E+00
MOLECULAR WEIGHT (g/mole)                      6.00E+01
SOLUBILITY LIMIT (mg/L)                        1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)    5.27E+00
BULK DENSITY OF AQUIFER (g/cm**3)              1.90E+00
POROSITY OF AQUIFER                            1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)      1.00E+01
DISPERSIVITY X DIRECTION (m)                   9.00E+00
DISPERSIVITY Y DIRECTION (m)                   4.00E+00
DISPERSIVITY Z DIRECTION (m)                   4.00E-01
PORE VELOCITY (m/y)                            5.70E+02
WELL SCREEN THICKNESS (m)                      1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)     8.46E+00
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)     0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)     0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)  1.89E+01
MASS RELEASE RATE TO POND (mg or Ci per y)     6.87E-04
OPERATION TIME OF POND (years)                 4.00E+00
LIQUID EFFLUENT FLOW RATE TO POND (m**3/y)     6.84E+03
MOISTURE CONTENT OF UNDERLYING SEDIMENTS       4.87E-01
EVAPORATION RATE CONSTANT FROM POND (y**-1)    0.00E+00
EFFECTIVE WIDTH OF POND AT AQUIFER (m)         2.49E+01
UNITS OF CONTAMINANT                           Ci
```

INPUT DATA FILE CREATED BY: _[signature]_ DATE 6/21/96

INPUT DATA CHECKED BY: _[signature: A. Whitaker]_ DATE 6/24/96

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   0.00E+00
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
************************************************************
LEACH RATE CONSTANT (1/y)                 1.1069E-03
UNSATURATED PORE VELOCITY (m/y)           4.9147E+01
DECAY CONSTANT(S) (1/y)                    1.3153E-01
RETARDATION FACTOR(S) (SATURATED)         1.9100E+02
LEACH RATE CONSTANT FROM POND SEDIMENTS   2.6451E-01
RETARDATION FACTOR (UNSATURATED)          1.8580E+02
SOLUBILITY LIMITED MASS (mg)              2.5844E+13
SOLUBILITY LIMITED ACTIVITY (Ci)          2.9243E+13
TRANSIT TIME IN UNSAT ZONE (years)        3.9167E+01
FRACTION DECAYED DURING UNSAT TRANSPORT   9.9421E-01

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
POND SEDIMENT INVENTORY AT END OF OPERATIONS:  1.38E-03 Ci
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
************************************************************
INTEGRATION TIME (years)           30
BODY WEIGHT (kg)                   7.000E+01
AVERAGING TIME (days)              2.556E+04
WATER INTAKE RATE (L/d)            2.000E+00
EXPOSURE FREQUENCY (days/year)     3.500E+02
EXPOSURE DURATION (years)          3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)    4.000E-03
CARCINOGENIC RISK CRITERIA         1.000E-07
HAZARD QUOTIENT                    1.000E-01

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
************************************************************
MAXIMUM AVERAGE GW CONCENTRATION BETWEEN YEARS  0.00E+00 AND  3.00E+01
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
MAXIMUM GW CONCENTRATION FOR MBR #1:        2.04E-14 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:        3.32E-15 Ci/L RISK =  1.32E-09
MAXIMUM CARCINOGENIC RISK:                  1.32E-09
LIMITING PARENT GROUNDWATER CONC. (Ci/L):   2.52E-13
PEAK TIME (y):                              4.319662E+01
LIMITING POND EFFLUENT CONCENTRATION (Ci/L):  7.627E-09
EXECUTION TIME (seconds)      3
```

OUTPUT FILE FOR PBF-05 Cs-137

TIME OF RUN 11:31:41.6
DATE OF RUN 06/21/96
INPUT FILE NAME: pbf05-cs.par
OUTPUT FILE NAME: pbf05-cs.out
===
                ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                        LIMITATION OF LIABILITY

===

****
*   *
*   This output was produced by the model: *
*   *
*   GWSCREEN   *
*   Version Control Copy, Version 2.4a   *
*   A semi-analytical model for the assessment   *
*   of the groundwater pathway from the leaching *
*   of surficial and buried contamination and   *
*   release of contaminants from percolation ponds *
*   02-28-95   *
*   Arthur S. Rood   *
*   Idaho National Engineering Laboratory   *
*   EG&G Idaho Inc.   *
*   Subsurface and Environmental Modeling Unit   *
*   PO Box 1625   *
*   Idaho Falls, Idaho 83415   *
****
>>> TITLE OF PROJECT:
PBF-05 Cs-137
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:2 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   1.69E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   1.69E+01
THICKNESS OF SOURCE (m)   1.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   4.87E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   2.80E+02
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   2.80E+02

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)              0.00E+00
MOLECULAR WEIGHT (g/mole)                        1.37E+02
SOLUBILITY LIMIT (mg/L)                          1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)      3.03E+01
BULK DENSITY OF AQUIFER (g/cm**3)                1.90E+00
POROSITY OF AQUIFER                              1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)        5.00E+02
DISPERSIVITY X DIRECTION (m)                     9.00E+00
DISPERSIVITY Y DIRECTION (m)                     4.00E+00
DISPERSIVITY Z DIRECTION (m)                     4.00E-01
PORE VELOCITY  (m/y)                             5.70E+02
WELL SCREEN THICKNESS (m)                        1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS       (m)      8.46E+00
DISTANCE TO RECEPTOR ALONG Y AXIS       (m)      0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS       (m)      0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)    3.16E+01
MASS RELEASE RATE TO POND (mg or Ci per y)       5.03E-02
OPERATION TIME OF POND (years)                   6.00E+00
LIQUID EFFLUENT FLOW RATE TO POND (m**3/y)       6.84E+03
MOISTURE CONTENT OF UNDERLYING SEDIMENTS         4.87E-01
EVAPORATION RATE CONSTANT FROM POND (y**-1)      0.00E+00
EFFECTIVE WIDTH OF POND AT AQUIFER (m)           2.49E+01
UNITS OF CONTAMINANT                             Ci
```

INPUT DATA FILE CREATED BY: _C//c-L_ DATE 6/21/96

INPUT DATA CHECKED BY: _CAWhitaker_ DATE 6/24/96

```
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LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   0.00E+00
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
************************************************************
LEACH RATE CONSTANT (1/y)                 2.3790E-04
UNSATURATED PORE VELOCITY (m/y)           4.9147E+01
DECAY CONSTANT(S) (1/y)                    2.2876E-02
RETARDATION FACTOR(S) (SATURATED)         9.5010E+03
LEACH RATE CONSTANT FROM POND SEDIMENTS   5.6921E-02
RETARDATION FACTOR (UNSATURATED)          8.6342E+02
SOLUBILITY LIMITED MASS (mg)              1.2010E+14
SOLUBILITY LIMITED ACTIVITY (Ci)          1.0351E+13
TRANSIT TIME IN UNSAT ZONE (years)        1.8201E+02
FRACTION DECAYED DURING UNSAT TRANSPORT   9.8445E-01

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
POND SEDIMENT INVENTORY AT END OF OPERATIONS: 2.40E-01 Ci
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
************************************************************
INTEGRATION TIME (years)          30
BODY WEIGHT (kg)                  7.000E+01
AVERAGING TIME (days)             2.556E+04
WATER INTAKE RATE (L/d)           2.000E+00
EXPOSURE FREQUENCY (days/year)    3.500E+02
EXPOSURE DURATION (years)         3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)   4.000E-03
CARCINOGENIC RISK CRITERIA        1.000E-07
HAZARD QUOTIENT                   1.000E-01
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
************************************************************
MAXIMUM AVERAGE GW CONCENTRATION BETWEEN YEARS  0.00E+00 AND  3.00E+01
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
MAXIMUM GW CONCENTRATION FOR MBR #1:          5.78E-14 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:          4.72E-14 Ci/L RISK =  3.13E-08
MAXIMUM CARCINOGENIC RISK:                    3.13E-08
LIMITING PARENT GROUNDWATER CONC. (Ci/L):     1.51E-13
PEAK TIME (y):                                1.884046E+02
LIMITING POND EFFLUENT CONCENTRATION (Ci/L):  2.350E-08
EXECUTION TIME (seconds)       7
```

OUTPUT FILE FOR PBF-05 H-3

TIME OF RUN 11:33:36.0
DATE OF RUN 06/21/96
INPUT FILE NAME: pbf05-h3.par
OUTPUT FILE NAME: pbf05-h3.out
==

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment   *
    *   of the groundwater pathway from the leaching   *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds   *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit   *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-05 H-3
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:2 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   1.69E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m) 1.69E+01
THICKNESS OF SOURCE (m)   1.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE 4.87E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   0.00E+00
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   0.00E+00

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)             0.00E+00
MOLECULAR WEIGHT (g/mole)                       3.00E+00
SOLUBILITY LIMIT (mg/L)                         1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)     1.23E+01
BULK DENSITY OF AQUIFER (g/cm**3)               1.90E+00
POROSITY OF AQUIFER                             1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)       0.00E+00
DISPERSIVITY X DIRECTION (m)                    9.00E+00
DISPERSIVITY Y DIRECTION (m)                    4.00E+00
DISPERSIVITY Z DIRECTION (m)                    4.00E-01
PORE VELOCITY  (m/y)                            5.70E+02
WELL SCREEN THICKNESS (m)                       1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS        (m)    8.46E+00
DISTANCE TO RECEPTOR ALONG Y AXIS        (m)    0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS        (m)    0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)   7.15E-02
MASS RELEASE RATE TO POND (mg or Ci per y)      3.00E-03
OPERATION TIME OF POND (years)                  7.00E+00
LIQUID EFFLUENT FLOW RATE TO POND (m**3/y)      6.84E+03
MOISTURE CONTENT OF UNDERLYING SEDIMENTS        4.87E-01
EVAPORATION RATE CONSTANT FROM POND (y**-1)     0.00E+00
EFFECTIVE WIDTH OF POND AT AQUIFER (m)          2.49E+01
UNITS OF CONTAMINANT                            Ci
```

INPUT DATA FILE CREATED BY: _____ DATE 6/24 96

INPUT DATA CHECKED BY: _____ DATE 6/24/96

```
-----------------------------------------------------------
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   0.00E+00
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
***********************************************************
LEACH RATE CONSTANT (1/y)                    2.9155E-01
UNSATURATED PORE VELOCITY (m/y)              4.9147E+01
DECAY CONSTANT(S) (1/y)                      5.6353E-02
RETARDATION FACTOR(S) (SATURATED)            1.0000E+00
LEACH RATE CONSTANT FROM POND SEDIMENTS      4.9147E+01
RETARDATION FACTOR (UNSATURATED)             1.0000E+00
SOLUBILITY LIMITED MASS (mg)                 1.3909E+11
SOLUBILITY LIMITED ACTIVITY (Ci)             1.3487E+12
TRANSIT TIME IN UNSAT ZONE (years)           2.1079E-01
FRACTION DECAYED DURING UNSAT TRANSPORT      1.1809E-02
-----------------------------------------------------------
POND SEDIMENT INVENTORY AT END OF OPERATIONS:  6.10E-05 Ci
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
***********************************************************
INTEGRATION TIME (years)          30
BODY WEIGHT (kg)                  7.000E+01
AVERAGING TIME (days)             2.556E+04
WATER INTAKE RATE (L/d)           2.000E+00
EXPOSURE FREQUENCY (days/year)    3.500E+02
EXPOSURE DURATION (years)         3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)   4.000E-03
CARCINOGENIC RISK CRITERIA        1.000E-07
HAZARD QUOTIENT                   1.000E-01
-----------------------------------------------------------
>>> RESULTS OF CALCULATIONS
***********************************************************
MAXIMUM AVERAGE GW CONCENTRATION BETWEEN YEARS  0.00E+00 AND  3.00E+01
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
MAXIMUM GW CONCENTRATION FOR MBR #1:          9.80E-11 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:          2.24E-11 Ci/L RISK =  3.36E-08
MAXIMUM CARCINOGENIC RISK:                    3.36E-08
LIMITING PARENT GROUNDWATER CONC. (Ci/L):     6.66E-11
PEAK TIME (y):                                1.608719E+00
LIMITING POND EFFLUENT CONCENTRATION (Ci/L):  1.306E-09
EXECUTION TIME (seconds)      8
```

OUTPUT FILE FOR PBF-05 Sr-90

TIME OF RUN 11:32:45.3
DATE OF RUN 06/21/96
INPUT FILE NAME: pbf05-sr.par
OUTPUT FILE NAME: pbf05-sr.out
```
================================================================================
              ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                      LIMITATION OF LIABILITY
```

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Energy, Office of Environmental Restoration and Waste Management,
DOE Field Office, Idaho, Contract Number DE-AC07-76ID01570.
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Software. Reproduced by permission from the book, Numerical Recipes,
Cambridge University Press.
```
================================================================================


  ********************************************************
  *                                                      *
  *       This output was produced by the model:         *
  *                                                      *
  *                    GWSCREEN                           *
  *         Version Control Copy, Version 2.4a            *
  *      A semi-analytical model for the assessment       *
  *      of the groundwater pathway from the leaching     *
  *      of surficial and buried contamination and        *
  *   release of contaminants from percolation ponds      *
  *                    02-28-95                           *
  *                  Arthur S. Rood                        *
  *        Idaho National Engineering Laboratory           *
  *                  EG&G Idaho Inc.                       *
  *      Subsurface and Environmental Modeling Unit        *
  *                   PO Box 1625                          *
  *            Idaho Falls, Idaho 83415                    *
  ********************************************************
```
>>> TITLE OF PROJECT:
PBF-05 Sr-90
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS = 5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:2 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
```
NUMBER OF RADIOACTIVE PROGENY                    0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)         1.69E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)     1.69E+01
THICKNESS OF SOURCE (m)                          1.00E+00
PERCOLATION RATE (darcy vel m/y)                 1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE               3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE     4.87E-01
BULK DENSITY AT SOURCE  (g/cm**3)                1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)            1.50E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)             1.50E+00
UNSATURATED ZONE THICKNESS (m)                   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)        1.50E+01
```

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)            0.00E+00
MOLECULAR WEIGHT (g/mole)                       9.00E+01
SOLUBILITY LIMIT (mg/L)                         1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)     2.91E+01
BULK DENSITY OF AQUIFER (g/cm**3)               1.90E+00
POROSITY OF AQUIFER                             1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)       2.40E+01
DISPERSIVITY X DIRECTION (m)                    9.00E+00
DISPERSIVITY Y DIRECTION (m)                    4.00E+00
DISPERSIVITY Z DIRECTION (m)                    4.00E-01
PORE VELOCITY (m/y)                             5.70E+02
WELL SCREEN THICKNESS (m)                       1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS     (m)       8.46E+00
DISTANCE TO RECEPTOR ALONG Y AXIS     (m)       0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS     (m)       0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)   5.59E+01
MASS RELEASE RATE TO POND (mg or Ci per y)      3.01E-04
OPERATION TIME OF POND (years)                  6.00E+00
LIQUID EFFLUENT FLOW RATE TO POND (m**3/y)      6.84E+03
MOISTURE CONTENT OF UNDERLYING SEDIMENTS        4.87E-01
EVAPORATION RATE CONSTANT FROM POND (y**-1)     0.00E+00
EFFECTIVE WIDTH OF POND AT AQUIFER (m)          2.49E+01
UNITS OF CONTAMINANT                            Ci
```

INPUT DATA FILE CREATED BY: _~~~~~~~~_ DATE 4/21/96

INPUT DATA CHECKED BY: _C A Whitaker_ DATE 6/24/96

```
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LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   0.00E+00
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
*******************************************************
LEACH RATE CONSTANT (1/y)                  4.3777E-03
UNSATURATED PORE VELOCITY (m/y)            4.9147E+01
DECAY CONSTANT(S) (1/y)                     2.3819E-02
RETARDATION FACTOR(S) (SATURATED)          4.5700E+02
LEACH RATE CONSTANT FROM POND SEDIMENTS    1.0412E+00
RETARDATION FACTOR (UNSATURATED)           4.7201E+01
SOLUBILITY LIMITED MASS (mg)               6.5653E+12
SOLUBILITY LIMITED ACTIVITY (Ci)           8.9691E+11
TRANSIT TIME IN UNSAT ZONE (years)         9.9498E+00
FRACTION DECAYED DURING UNSAT TRANSPORT    2.1101E-01
-------------------------------------------------------
POND SEDIMENT INVENTORY AT END OF OPERATIONS:  2.82E-04 Ci
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
*******************************************************
INTEGRATION TIME (years)           30
BODY WEIGHT (kg)                   7.000E+01
AVERAGING TIME (days)              2.556E+04
WATER INTAKE RATE (L/d)            2.000E+00
EXPOSURE FREQUENCY (days/year)     3.500E+02
EXPOSURE DURATION (years)          3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)    4.000E-03
CARCINOGENIC RISK CRITERIA         1.000E-07
HAZARD QUOTIENT                    1.000E-01
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
*******************************************************
MAXIMUM AVERAGE GW CONCENTRATION BETWEEN YEARS  5.53E-01 AND  3.06E+01
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
MAXIMUM GW CONCENTRATION FOR MBR #1:         2.25E-12 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:         8.99E-13 Ci/L RISK = 1.05E-06
MAXIMUM CARCINOGENIC RISK:                   1.05E-06
LIMITING PARENT GROUNDWATER CONC. (Ci/L):    8.52E-14
PEAK TIME (y):                               1.599444E+01
LIMITING POND EFFLUENT CONCENTRATION (Ci/L): 4.175E-12
EXECUTION TIME (seconds)       5
```

OUTPUT FILE FOR PBF15 Cr-III


```
TIME OF RUN 16:46:17.7
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf15-cr.par
OUTPUT FILE NAME: pbf15-cr.out
===============================================================================
               ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                       LIMITATION OF LIABILITY

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  Cambridge University Press.
===============================================================================


  *********************************************************
  *                                                       *
  *        This output was produced by the model:         *
  *                                                       *
  *                     GWSCREEN                           *
  *          Version Control Copy, Version 2.4a            *
  *       A semi-analytical model for the assessment       *
  *       of the groundwater pathway from the leaching     *
  *       of surficial and buried contamination and        *
  *   release of contaminants from percolation ponds       *
  *                     02-28-95                           *
  *                   Arthur S. Rood                       *
  *          Idaho National Engineering Laboratory         *
  *                   EG&G Idaho Inc.                      *
  *       Subsurface and Environmental Modeling Unit       *
  *                   PO Box 1625                          *
  *            Idaho Falls, Idaho 83415                    *
  *********************************************************
>>> TITLE OF PROJECT:
PBF-15 Cr-III
-------------------------------------------------------------
SIMPSON RULE SOLUTION
JSTART =  6
JMAX = 12
EPS =    5.0000E-03
MODEL OPTIONS
IMODE: 6
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:2 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
**************************************************************
NUMBER OF RADIOACTIVE PROGENY                  0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)       8.50E+00
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   8.50E+00
THICKNESS OF SOURCE (m)                        1.00E+00
PERCOLATION RATE (darcy vel m/y)               1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE             3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   4.87E-01
BULK DENSITY AT SOURCE  (g/cm**3)              1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)          7.00E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)           1.50E+00
UNSATURATED ZONE THICKNESS (m)                 1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)      7.00E+01
```

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)             0.00E+00
MOLECULAR WEIGHT (g/mole)                       5.20E+01
SOLUBILITY LIMIT (mg/L)                         1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)     1.00E+38
BULK DENSITY OF AQUIFER (g/cm**3)               1.90E+00
POROSITY OF AQUIFER                             1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)       1.20E+00
DISPERSIVITY X DIRECTION (m)                    9.00E+00
DISPERSIVITY Y DIRECTION (m)                    4.00E+00
DISPERSIVITY Z DIRECTION (m)                    4.00E-01
PORE VELOCITY  (m/y)                            5.70E+02
WELL SCREEN THICKNESS (m)                       1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)      4.25E+00
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)      0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)      0.00E+00
NON-CARCINOGENIC REFERENCE DOSE RfD (mg/kg/d)   1.00E+00
MASS RELEASE RATE TO POND (mg or Ci per y)      3.77E+04
OPERATION TIME OF POND (years)                  8.00E+00
LIQUID EFFLUENT FLOW RATE TO POND (m**3/y)      1.73E+03
MOISTURE CONTENT OF UNDERLYING SEDIMENTS        4.87E-01
EVAPORATION RATE CONSTANT FROM POND (y**-1)     0.00E+00
EFFECTIVE WIDTH OF POND AT AQUIFER (m)          1.05E+01
UNITS OF CONTAMINANT                            mg
```

INPUT DATA FILE CREATED BY: _[signature]_ DATE 6/07 96

INPUT DATA CHECKED BY: _[signature]_ C A Whitbeck DATE 6/24 96

LIMITING SOIL CONCENTRATION CALCULATION
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
****

```
LEACH RATE CONSTANT (1/y)                  9.4928E-04
UNSATURATED PORE VELOCITY (m/y)            4.9088E+01
DECAY CONSTANT(S) (1/y)                    0.0000E+00
RETARDATION FACTOR(S) (SATURATED)          2.3800E+01
LEACH RATE CONSTANT FROM POND SEDIMENTS    2.2662E-01
RETARDATION FACTOR (UNSATURATED)           2.1661E+02
SOLUBILITY LIMITED MASS (mg)               7.6250E+12
SOLUBILITY LIMITED ACTIVITY (Ci)           0.0000E+00
TRANSIT TIME IN UNSAT ZONE (years)         4.5715E+01
FRACTION DECAYED DURING UNSAT TRANSPORT    0.0000E+00
```

POND SEDIMENT INVENTORY AT END OF OPERATIONS: 1.39E+05 mg
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
****

```
INTEGRATION TIME (years)            30
BODY WEIGHT (kg)                    7.000E+01
AVERAGING TIME (days)               1.095E+04
WATER INTAKE RATE (L/d)             2.000E+00
EXPOSURE FREQUENCY (days/year)      3.500E+02
EXPOSURE DURATION (years)           3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)     1.000E-06
CARCINOGENIC RISK CRITERIA          1.000E-07
HAZARD QUOTIENT                     1.000E-01
```

>>> RESULTS OF CALCULATIONS
****

```
MAXIMUM AVERAGE GW CONCENTRATION BETWEEN YEARS  0.00E+00 AND  3.00E+01
LIMITING GROUNDWATER CONCENTRATION (mg/L):      3.65E+00
MAXIMUM GROUNDWATER CONCENTRATION (mg/L):       1.57E-03
AVERAGE GROUNDWATER CONCENTRATION (mg/L):       2.88E-04
HAZARD QUOTIENT FOR INPUT MASS:                 7.89E-06
PEAK TIME (y):                                  5.371578E+01
LIMITING POND EFFLUENT CONCENTRATION (mg/L):    2.763E+02
EXECUTION TIME (seconds)                        10
```

OUTPUT FILE FOR PBF15 Hydrazine

TIME OF RUN 16:48:44.2
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf15-hy.par
OUTPUT FILE NAME: pbf15-hy.out
==
             ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                     LIMITATION OF LIABILITY

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==

****
*   *
*   This output was produced by the model: *
*   *
*   GWSCREEN   *
*   Version Control Copy, Version 2.4a   *
*   A semi-analytical model for the assessment   *
*   of the groundwater pathway from the leaching   *
*   of surficial and buried contamination and   *
*   release of contaminants from percolation ponds   *
*   02-28-95   *
*   Arthur S. Rood   *
*   Idaho National Engineering Laboratory   *
*   EG&G Idaho Inc.   *
*   Subsurface and Environmental Modeling Unit   *
*   PO Box 1625   *
*   Idaho Falls, Idaho 83415   *
****
>>> TITLE OF PROJECT:
PBF-15 Hydrazine

SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 5
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:2 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   8.50E+00
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   8.50E+00
THICKNESS OF SOURCE (m)   1.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   4.87E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   3.00E-04
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   3.00E-04

                              J-703

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)             0.00E+00
MOLECULAR WEIGHT (g/mole)                       3.20E+01
SOLUBILITY LIMIT (mg/L)                         1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)     1.00E+38
BULK DENSITY OF AQUIFER (g/cm**3)               1.90E+00
POROSITY OF AQUIFER                             1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)       3.00E-04
DISPERSIVITY X DIRECTION (m)                    9.00E+00
DISPERSIVITY Y DIRECTION (m)                    4.00E+00
DISPERSIVITY Z DIRECTION (m)                    4.00E-01
PORE VELOCITY  (m/y)                            5.70E+02
WELL SCREEN THICKNESS (m)                       1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)      4.25E+00
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)      0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)      0.00E+00
CARCINOGENIC SLOPE FACTOR (mg/kg/d)**-1         3.00E+00
MASS RELEASE RATE TO POND (mg or Ci per y)      1.00E+03
OPERATION TIME OF POND (years)                  1.00E+00
LIQUID EFFLUENT FLOW RATE TO POND (m**3/y)      1.73E+03
MOISTURE CONTENT OF UNDERLYING SEDIMENTS        4.87E-01
EVAPORATION RATE CONSTANT FROM POND (y**-1)     0.00E+00
EFFECTIVE WIDTH OF POND AT AQUIFER (m)          1.05E+01
UNITS OF CONTAMINANT                            mg
```

INPUT DATA FILE CREATED BY: _W. Reel_____ DATE 6/7/96

INPUT DATA CHECKED BY: _C.A. Whitaker_ DATE 6/24/96

```
---------------------------------------------------------
LIMITING SOIL CONCENTRATION CALCULATION
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
*********************************************************
LEACH RATE CONSTANT (1/y)                    2.9116E-01
UNSATURATED PORE VELOCITY (m/y)              4.9088E+01
DECAY CONSTANT(S) (1/y)                      0.0000E+00
RETARDATION FACTOR(S) (SATURATED)            1.0057E+00
LEACH RATE CONSTANT FROM POND SEDIMENTS      4.9042E+01
RETARDATION FACTOR (UNSATURATED)             1.0009E+00
SOLUBILITY LIMITED MASS (mg)                 3.5235E+10
SOLUBILITY LIMITED ACTIVITY (Ci)             0.0000E+00
TRANSIT TIME IN UNSAT ZONE (years)           2.1125E-01
FRACTION DECAYED DURING UNSAT TRANSPORT      0.0000E+00
---------------------------------------------------------
POND SEDIMENT INVENTORY AT END OF OPERATIONS:  2.04E+01 mg
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
*********************************************************
INTEGRATION TIME (years)         30
BODY WEIGHT (kg)                 7.000E+01
AVERAGING TIME (days)            2.556E+04
WATER INTAKE RATE (L/d)          2.000E+00
EXPOSURE FREQUENCY (days/year)   3.500E+02
EXPOSURE DURATION (years)        3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)  1.000E-06
CARCINOGENIC RISK CRITERIA       1.000E-07
HAZARD QUOTIENT                  1.000E-01
---------------------------------------------------------
>>> RESULTS OF CALCULATIONS
*********************************************************
MAXIMUM AVERAGE GW CONCENTRATION BETWEEN YEARS  0.00E+00 AND  3.00E+01
CARCINOGENIC RISK CALCULATION
LIMITING GROUNDWATER CONCENTRATION (mg/L):      2.84E-06
MAXIMUM GROUNDWATER CONCENTRATION (mg/L):       5.13E-05
AVERAGE GROUNDWATER CONCENTRATION (mg/L):       2.30E-06
CARCINOGENIC RISK FOR USER INPUT MASS:          8.10E-08
PEAK TIME (y):                                  5.377332E-01
LIMITING POND EFFLUENT CONCENTRATION (mg/L):    7.142E-04
EXECUTION TIME (seconds)                        8
```

OUTPUT FILE FOR PBF15 Zinc

TIME OF RUN 16:49:23.7
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf15-zn.par
OUTPUT FILE NAME: pbf15-zn.out
===

```
****************************************************
*                                                  *
*       This output was produced by the model:     *
*                                                  *
*                   GWSCREEN                        *
*          Version Control Copy, Version 2.4a       *
*       A semi-analytical model for the assessment  *
*       of the groundwater pathway from the leaching *
*       of surficial and buried contamination and   *
*    release of contaminants from percolation ponds *
*                   02-28-95                         *
*                  Arthur S. Rood                    *
*       Idaho National Engineering Laboratory        *
*                  EG&G Idaho Inc.                   *
*       Subsurface and Environmental Modeling Unit   *
*                   PO Box 1625                      *
*              Idaho Falls, Idaho 83415              *
****************************************************
```
>>> TITLE OF PROJECT:
PBF-15 Zinc
~~~~~~

SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 6
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:2 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****

NUMBER OF RADIOACTIVE PROGENY	0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)	8.50E+00
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)	8.50E+00
THICKNESS OF SOURCE (m)	1.00E+00
PERCOLATION RATE (darcy vel m/y)	1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE	3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE	4.87E-01
BULK DENSITY AT SOURCE (g/cm**3)	1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)	2.00E+02
BULK DENSITY IN UNSAT ZONE (g/cm**3)	1.50E+00
UNSATURATED ZONE THICKNESS (m)	1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)	2.00E+02

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)             0.00E+00
MOLECULAR WEIGHT (g/mole)                       6.54E+01
SOLUBILITY LIMIT (mg/L)                         1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)     1.00E+38
BULK DENSITY OF AQUIFER (g/cm**3)               1.90E+00
POROSITY OF AQUIFER                             1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)       1.60E+01
DISPERSIVITY X DIRECTION (m)                    9.00E+00
DISPERSIVITY Y DIRECTION (m)                    4.00E+00
DISPERSIVITY Z DIRECTION (m)                    4.00E-01
PORE VELOCITY (m/y)                             5.70E+02
WELL SCREEN THICKNESS (m)                       1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS        (m)    4.25E+00
DISTANCE TO RECEPTOR ALONG Y AXIS        (m)    0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS        (m)    0.00E+00
NON-CARCINOGENIC REFERENCE DOSE RfD (mg/kg/d)   3.00E-01
MASS RELEASE RATE TO POND (mg or Ci per y)      6.33E+03
OPERATION TIME OF POND (years)                  3.00E+00
LIQUID EFFLUENT FLOW RATE TO POND (m**3/y)      1.73E+03
MOISTURE CONTENT OF UNDERLYING SEDIMENTS        4.87E-01
EVAPORATION RATE CONSTANT FROM POND (y**-1)     0.00E+00
EFFECTIVE WIDTH OF POND AT AQUIFER (m)          1.05E+01
UNITS OF CONTAMINANT                            mg
```

INPUT DATA FILE CREATED BY: _U. J. K. L_ DATE 6/7/96

INPUT DATA CHECKED BY: _A Whitaker_ DATE 6/24/96

```
LIMITING SOIL CONCENTRATION CALCULATION
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
**********************************************************
LEACH RATE CONSTANT (1/y)                   3.3295E-04
UNSATURATED PORE VELOCITY (m/y)             4.9088E+01
DECAY CONSTANT(S) (1/y)                      0.0000E+00
RETARDATION FACTOR(S) (SATURATED)           3.0500E+02
LEACH RATE CONSTANT FROM POND SEDIMENTS     7.9557E-02
RETARDATION FACTOR (UNSATURATED)            6.1702E+02
SOLUBILITY LIMITED MASS (mg)                2.1720E+13
SOLUBILITY LIMITED ACTIVITY (Ci)            0.0000E+00
TRANSIT TIME IN UNSAT ZONE (years)          1.3022E+02
FRACTION DECAYED DURING UNSAT TRANSPORT     0.0000E+00
```

```
POND SEDIMENT INVENTORY AT END OF OPERATIONS:  1.69E+04 mg
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
**********************************************************
INTEGRATION TIME (years)            30
BODY WEIGHT (kg)                    7.000E+01
AVERAGING TIME (days)               1.095E+04
WATER INTAKE RATE (L/d)             2.000E+00
EXPOSURE FREQUENCY (days/year)      3.500E+02
EXPOSURE DURATION (years)           3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)     1.000E-06
CARCINOGENIC RISK CRITERIA          1.000E-07
HAZARD QUOTIENT                     1.000E-01
```

```
>>> RESULTS OF CALCULATIONS
**********************************************************
MAXIMUM AVERAGE GW CONCENTRATION BETWEEN YEARS  0.00E+00 AND  3.00E+01
LIMITING GROUNDWATER CONCENTRATION (mg/L):      1.09E+00
MAXIMUM GROUNDWATER CONCENTRATION (mg/L):       2.15E-05
AVERAGE GROUNDWATER CONCENTRATION (mg/L):       3.59E-06
HAZARD QUOTIENT FOR INPUT MASS:                 3.28E-07
PEAK TIME (y):                                  1.332316E+02
LIMITING POND EFFLUENT CONCENTRATION (mg/L):    1.117E+03
EXECUTION TIME (seconds)                        3
```

OUTPUT FILE FOR PBF22 Ag

TIME OF RUN 16:02:29.2
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf22-ag.par
OUTPUT FILE NAME: pbf22-ag.out
==
                ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                        LIMITATION OF LIABILITY

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment   *
    *   of the groundwater pathway from the leaching *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit   *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 Ag
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 6
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m) 6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE 3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   9.00E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   9.00E+01

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)            1.66E+07
MOLECULAR WEIGHT (g/mole)                      1.08E+02
SOLUBILITY LIMIT (mg/L)                        1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)    1.00E+38
BULK DENSITY OF AQUIFER (g/cm**3)              1.90E+00
POROSITY OF AQUIFER                            1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)      9.00E+01
DISPERSIVITY X DIRECTION (m)                   9.00E+00
DISPERSIVITY Y DIRECTION (m)                   4.00E+00
DISPERSIVITY Z DIRECTION (m)                   4.00E-01
PORE VELOCITY  (m/y)                           5.70E+02
WELL SCREEN THICKNESS (m)                      1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)     3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)     0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)     0.00E+00
NON-CARCINOGENIC REFERENCE DOSE RfD (mg/kg/d)  5.00E-03
UNITS OF CONTAMINANT                           mg
```

INPUT DATA FILE CREATED BY: _____ DATE 6/ 7/ 96

INPUT DATA CHECKED BY: C A Whitten   DATE 6/24/96

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LIMITING SOIL CONCENTRATION CALCULATION
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
**********************************************************
LEACH RATE CONSTANT (1/y)                2.4629E-04
UNSATURATED PORE VELOCITY (m/y)          2.9155E-01
DECAY CONSTANT(S) (1/y)                  0.0000E+00
RETARDATION FACTOR(S) (SATURATED)        1.7110E+03
RETARDATION FACTOR (UNSATURATED)         3.9459E+02
SOLUBILITY LIMITED MASS (mg)             1.7208E+15
SOLUBILITY LIMITED ACTIVITY (Ci)         0.0000E+00
TRANSIT TIME IN UNSAT ZONE (years)       1.4022E+04
FRACTION DECAYED DURING UNSAT TRANSPORT  0.0000E+00

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
**********************************************************
INTEGRATION TIME (years)          30
BODY WEIGHT (kg)                  7.000E+01
AVERAGING TIME (days)             1.095E+04
WATER INTAKE RATE (L/d)           2.000E+00
EXPOSURE FREQUENCY (days/year)    3.500E+02
EXPOSURE DURATION (years)         3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)   1.000E-06
CARCINOGENIC RISK CRITERIA        1.000E-07
HAZARD QUOTIENT                   1.000E-01

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
**********************************************************
LIMITING GROUNDWATER CONCENTRATION (mg/L):    1.82E-02
MAXIMUM GROUNDWATER CONCENTRATION (mg/L):     5.96E-05
AVERAGE GROUNDWATER CONCENTRATION (mg/L):     5.96E-05
HAZARD QUOTIENT FOR INPUT MASS:               3.26E-04
PEAK TIME (y):                                1.445032E+04
LIMITING SOIL CONCENTRATION (mg/m**3):        3.997E+05
LIMITING SOIL CONCENTRATION (mg/kg):          2.665E+02
LIMITING INVENTORY IN SOIL (mg):              5.082E+09
EXECUTION TIME (seconds)                      0
```

OUTPUT FILE FOR PBF-22 Am-241

TIME OF RUN 15:59:28.1
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf22-am.par
OUTPUT FILE NAME: pbf22-am.out
===
                ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                         LIMITATION OF LIABILITY

===

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment   *
    *   of the groundwater pathway from the leaching *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit   *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 Am-241

SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS = 5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   3
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   1.90E+03
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   1.90E+03
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00

                              J-709

```
INITIAL MASS OR ACTIVITY (mg or Ci)            5.72E-04
MOLECULAR WEIGHT (g/mole)                       2.41E+02
SOLUBILITY LIMIT (mg/L)                         1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)     4.32E+02 2.14E+06 1.59E+05 7.34E+03
BULK DENSITY OF AQUIFER (g/cm**3)               1.90E+00
POROSITY OF AQUIFER                             1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)       3.40E+02 0.00E+00 0.00E+00 0.00E+00
DISPERSIVITY X DIRECTION (m)                    9.00E+00
DISPERSIVITY Y DIRECTION (m)                    4.00E+00
DISPERSIVITY Z DIRECTION (m)                    4.00E-01
PORE VELOCITY  (m/y)                            5.70E+02
WELL SCREEN THICKNESS (m)                       1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS        (m)    3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS        (m)    0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS        (m)    0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)   3.28E+02 2.95E+02 4.48E+01 3.65E+02
UNITS OF CONTAMINANT                            Ci

INPUT DATA FILE CREATED BY: _____ DATE 6, 7, 96

INPUT DATA CHECKED BY:    C A Whitaker   DATE 6 /24 96


~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   1.66E-01
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
*********************************************************
LEACH RATE CONSTANT (1/y)              1.1694E-05
UNSATURATED PORE VELOCITY (m/y)        2.9155E-01
DECAY CONSTANT(S) (1/y)                1.6045E-03 3.2390E-07 4.3594E-06 9.4434E-05
RETARDATION FACTOR(S) (SATURATED)      6.4610E+03 1.0000E+00 1.0000E+00 1.0000E+00
RETARDATION FACTOR (UNSATURATED)       8.3100E+03
SOLUBILITY LIMITED MASS (mg)           3.6239E+16
SOLUBILITY LIMITED ACTIVITY (Ci)       1.2454E+14
TRANSIT TIME IN UNSAT ZONE (years)     2.9530E+05
FRACTION DECAYED DURING UNSAT TRANSPORT 1.0000E+00

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
*********************************************************
INTEGRATION TIME (years)        30
BODY WEIGHT (kg)                7.000E+01
AVERAGING TIME (days)           2.556E+04
WATER INTAKE RATE (L/d)         2.000E+00
EXPOSURE FREQUENCY (days/year)  3.500E+02
EXPOSURE DURATION (years)       3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y) 1.000E-06
CARCINOGENIC RISK CRITERIA      1.000E-07
HAZARD QUOTIENT                 1.000E-01
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
*********************************************************
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
DECAY-INGROWTH FACTORS: 7.3932-207  1.8346E-04  1.3797E-04  1.3574E-04
NOTE: PROGENY CONCENTRATIONS ARE REPORTED AT THE TIME OF THE MAXIMUM PARENT CONCENTRATION
MAXIMUM GW CONCENTRATION FOR MBR #1:  4.70-223 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:  4.70-223 Ci/L RISK = 3.24-216
MAXIMUM GW CONCENTRATION FOR MBR #2:  7.54E-17 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #2:  7.54E-17 Ci/L RISK = 4.67E-10
MAXIMUM GW CONCENTRATION FOR MBR #3:  5.67E-17 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #3:  5.67E-17 Ci/L RISK = 5.33E-11
MAXIMUM GW CONCENTRATION FOR MBR #4:  5.58E-17 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #4:  5.58E-17 Ci/L RISK = 4.28E-10
MAXIMUM CARCINOGENIC RISK:             9.48E-10
LIMITING PARENT GROUNDWATER CONC. (Ci/L): 4.96-221
PEAK TIME (y):                         2.958133E+05
LIMITING SOIL CONCENTRATION (Ci/m**3): 4.746E-06
LIMITING SOIL CONCENTRATION (Ci/kg):   3.164E-09
LIMITING INVENTORY IN SOIL (Ci):       6.034E-02
LIMITING INVENTORY IN SOIL (mg):       1.756E+01
SPECIFIC ACTIVITY (Ci/g):              3.437E+00
EXECUTION TIME (seconds)               0
```

OUTPUT FILE FOR PBF22 Arochlor-1248

TIME OF RUN 16:42:24.4
DATE OF RUN 06/12/96
INPUT FILE NAME: pbf22-a2.par
OUTPUT FILE NAME: pbf22-a2.out
===
                ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                        LIMITATION OF LIABILITY

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    Cambridge University Press.
===

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment   *
    *   of the groundwater pathway from the leaching   *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds   *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit   *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 Arochlor 1248

SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 6
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m) 6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE 3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   1.00E+02
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   1.00E+02

J-711

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)             4.58E+05
MOLECULAR WEIGHT (g/mole)                        3.72E+02
SOLUBILITY LIMIT (mg/L)                          1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)      1.00E+38
BULK DENSITY OF AQUIFER (g/cm**3)                1.90E+00
POROSITY OF AQUIFER                              1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)        1.00E+01
DISPERSIVITY X DIRECTION (m)                     9.00E+00
DISPERSIVITY Y DIRECTION (m)                     4.00E+00
DISPERSIVITY Z DIRECTION (m)                     4.00E-01
PORE VELOCITY  (m/y)                             5.70E+02
WELL SCREEN THICKNESS (m)                        1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS       (m)      3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS       (m)      0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS       (m)      0.00E+00
NON-CARCINOGENIC REFERENCE DOSE RfD (mg/kg/d)    2.00E-05
UNITS OF CONTAMINANT                             mg

INPUT DATA FILE CREATED BY:                  DATE 6/14/96

INPUT DATA CHECKED BY:       CA Whitaker   DATE 6/24/96

--------------------------------------------------------------
LIMITING SOIL CONCENTRATION CALCULATION
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
*************************************************************
LEACH RATE CONSTANT (1/y)                2.2172E-04
UNSATURATED PORE VELOCITY (m/y)          2.9155E-01
DECAY CONSTANT(S) (1/y)                  0.0000E+00
RETARDATION FACTOR(S) (SATURATED)        1.9100E+02
RETARDATION FACTOR (UNSATURATED)         4.3832E+02
SOLUBILITY LIMITED MASS (mg)             1.9115E+15
SOLUBILITY LIMITED ACTIVITY (Ci)         0.0000E+00
TRANSIT TIME IN UNSAT ZONE (years)       1.5576E+04
FRACTION DECAYED DURING UNSAT TRANSPORT  0.0000E+00

--------------------------------------------------------------
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
*************************************************************
INTEGRATION TIME (years)        30
BODY WEIGHT (kg)                7.000E+01
AVERAGING TIME (days)           1.095E+04
WATER INTAKE RATE (L/d)         2.000E+00
EXPOSURE FREQUENCY (days/year)  3.500E+02
EXPOSURE DURATION (years)       3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y) 1.000E-06
CARCINOGENIC RISK CRITERIA      1.000E-07
HAZARD QUOTIENT                 1.000E-01

--------------------------------------------------------------
>>> RESULTS OF CALCULATIONS
*************************************************************
LIMITING GROUNDWATER CONCENTRATION (mg/L):   7.30E-05
MAXIMUM GROUNDWATER CONCENTRATION (mg/L):    1.61E-06
AVERAGE GROUNDWATER CONCENTRATION (mg/L):    1.60E-06
HAZARD QUOTIENT FOR INPUT MASS:              2.20E-03
PEAK TIME (y):                               1.564683E+04
LIMITING SOIL CONCENTRATION (mg/m**3):       1.639E+03
LIMITING SOIL CONCENTRATION (mg/kg):         1.093E+00
LIMITING INVENTORY IN SOIL (mg):             2.084E+07
EXECUTION TIME (seconds)                     0
```

OUTPUT FILE FOR PBF22 Arochlor-1254

TIME OF RUN 16:42:13.9
DATE OF RUN 06/12/96
INPUT FILE NAME: pbf22-ar.par
OUTPUT FILE NAME: pbf22-ar.out
```
================================================================================
```
```
================================================================================
```

```
****************************************************
*                                                  *
*       This output was produced by the model:     *
*                                                  *
*                    GWSCREEN                       *
*          Version Control Copy, Version 2.4a       *
*      A semi-analytical model for the assessment   *
*      of the groundwater pathway from the leaching *
*      of surficial and buried contamination and    *
*  release of contaminants from percolation ponds   *
*                    02-28-95                        *
*                  Arthur S. Rood                    *
*        Idaho National Engineering Laboratory       *
*                  EG&G Idaho Inc.                   *
*      Subsurface and Environmental Modeling Unit    *
*                   PO Box 1625                       *
*            Idaho Falls, Idaho 83415                *
****************************************************
```
>>> TITLE OF PROJECT:
PBF-22 Arachlor 1254
```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 6
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
```
******************************************************************
```

NUMBER OF RADIOACTIVE PROGENY	0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)	6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)	6.51E+01
THICKNESS OF SOURCE (m)	3.00E+00
PERCOLATION RATE (darcy vel m/y)	1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE	3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE	3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)	1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)	1.00E+02
BULK DENSITY IN UNSAT ZONE (g/cm**3)	1.50E+00
UNSATURATED ZONE THICKNESS (m)	1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)	1.00E+02

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)            1.49E+07
MOLECULAR WEIGHT (g/mole)                       3.72E+02
SOLUBILITY LIMIT (mg/L)                         1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)     1.00E+38
BULK DENSITY OF AQUIFER (g/cm**3)               1.90E+00
POROSITY OF AQUIFER                             1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)       1.00E+01
DISPERSIVITY X DIRECTION (m)                    9.00E+00
DISPERSIVITY Y DIRECTION (m)                    4.00E+00
DISPERSIVITY Z DIRECTION (m)                    4.00E-01
PORE VELOCITY  (m/y)                            5.70E+02
WELL SCREEN THICKNESS (m)                       1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)      3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)      0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)      0.00E+00
NON-CARCINOGENIC REFERENCE DOSE RfD (mg/kg/d)   2.00E-05
UNITS OF CONTAMINANT                            mg
```

INPUT DATA FILE CREATED BY: _____ DATE 6/12/96

INPUT DATA CHECKED BY: _C.A. Whitaker_ DATE 6/24/96

```
------------------------------------------------------------
LIMITING SOIL CONCENTRATION CALCULATION
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
************************************************************
LEACH RATE CONSTANT (1/y)               2.2172E-04
UNSATURATED PORE VELOCITY (m/y)         2.9155E-01
DECAY CONSTANT(S) (1/y)                 0.0000E+00
RETARDATION FACTOR(S) (SATURATED)       1.9100E+02
RETARDATION FACTOR (UNSATURATED)        4.3832E+02
SOLUBILITY LIMITED MASS (mg)            1.9115E+15
SOLUBILITY LIMITED ACTIVITY (Ci)        0.0000E+00
TRANSIT TIME IN UNSAT ZONE (years)      1.5576E+04
FRACTION DECAYED DURING UNSAT TRANSPORT  0.0000E+00

------------------------------------------------------------
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
************************************************************
INTEGRATION TIME (years)         30
BODY WEIGHT (kg)                 7.000E+01
AVERAGING TIME (days)            1.095E+04
WATER INTAKE RATE (L/d)          2.000E+00
EXPOSURE FREQUENCY (days/year)   3.500E+02
EXPOSURE DURATION (years)        3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)  1.000E-06
CARCINOGENIC RISK CRITERIA       1.000E-07
HAZARD QUOTIENT                  1.000E-01

------------------------------------------------------------
>>> RESULTS OF CALCULATIONS
************************************************************
LIMITING GROUNDWATER CONCENTRATION (mg/L):   7.30E-05
MAXIMUM GROUNDWATER CONCENTRATION (mg/L):    5.22E-05
AVERAGE GROUNDWATER CONCENTRATION (mg/L):    5.21E-05
HAZARD QUOTIENT FOR INPUT MASS:              7.14E-02
PEAK TIME (y):                               1.564683E+04
LIMITING SOIL CONCENTRATION (mg/m**3):       1.639E+03
LIMITING SOIL CONCENTRATION (mg/kg):         1.093E+00
LIMITING INVENTORY IN SOIL (mg):             2.084E+07
EXECUTION TIME (seconds)                     0
```

OUTPUT FILE FOR PBF22 Co-60

TIME OF RUN 15:57:48.1
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf22-co.par
OUTPUT FILE NAME: pbf22-co.out
==
==

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment *
    *   of the groundwater pathway from the leaching *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 Co-60
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m) 6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE 3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   6.00E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   6.00E+01

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)            4.29E-02
MOLECULAR WEIGHT (g/mole)                      6.00E+01
SOLUBILITY LIMIT (mg/L)                        1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)    5.27E+00
BULK DENSITY OF AQUIFER (g/cm**3)              1.90E+00
POROSITY OF AQUIFER                            1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)      1.00E+01
DISPERSIVITY X DIRECTION (m)                   9.00E+00
DISPERSIVITY Y DIRECTION (m)                   4.00E+00
DISPERSIVITY Z DIRECTION (m)                   4.00E-01
PORE VELOCITY  (m/y)                           5.70E+02
WELL SCREEN THICKNESS (m)                      1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)     3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)     0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)     0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)  1.89E+01
UNITS OF CONTAMINANT                           Ci
```

INPUT DATA FILE CREATED BY: _____ DATE 6/7/96

INPUT DATA CHECKED BY: _____ DATE 6/24/96

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   3.79E-02
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
**********************************************************
LEACH RATE CONSTANT (1/y)                 3.6896E-04
UNSATURATED PORE VELOCITY (m/y)           2.9155E-01
DECAY CONSTANT(S) (1/y)                   1.3153E-01
RETARDATION FACTOR(S) (SATURATED)         1.9100E+02
RETARDATION FACTOR (UNSATURATED)          2.6339E+02
SOLUBILITY LIMITED MASS (mg)              1.1486E+15
SOLUBILITY LIMITED ACTIVITY (Ci)          1.2997E+15
TRANSIT TIME IN UNSAT ZONE (years)        9.3595E+03
FRACTION DECAYED DURING UNSAT TRANSPORT   1.0000E+00

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
**********************************************************
INTEGRATION TIME (years)          30
BODY WEIGHT (kg)                  7.000E+01
AVERAGING TIME (days)             2.556E+04
WATER INTAKE RATE (L/d)           2.000E+00
EXPOSURE FREQUENCY (days/year)    3.500E+02
EXPOSURE DURATION (years)         3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)   1.000E-06
CARCINOGENIC RISK CRITERIA        1.000E-07
HAZARD QUOTIENT                   1.000E-01

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
**********************************************************
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
MAXIMUM GW CONCENTRATION FOR MBR #1:       1.97-231 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:       1.17-231 Ci/L RISK = 4.64-226
MAXIMUM CARCINOGENIC RISK:                 4.64-226
LIMITING PARENT GROUNDWATER CONC. (Ci/L):  2.52E-13
PEAK TIME (y):                             9.367800E+03
LIMITING SOIL CONCENTRATION (Ci/m**3):     7.278+212
LIMITING SOIL CONCENTRATION (Ci/kg):       4.852+209
LIMITING INVENTORY IN SOIL (Ci):           9.253+216
LIMITING INVENTORY IN SOIL (mg):           8.177+216
SPECIFIC ACTIVITY (Ci/g):                  1.132E+03
NOTE: THE LIMITING SOIL CONCENTRATION OF  4.852+206 Ci/g
      EXCEEDS THE SPECIFIC ACTIVITY OF THE NUCLIDE.
WARNING !!! THE LIMITING SOIL MASS OF  8.177+216 mg
EXCEEDS THE SOLUBILITY LIMITED SOURCE MASS OF 1.149E+15 mg
EXECUTION TIME (seconds)      0
```

OUTPUT FILE FOR PBF22 Cr-III

TIME OF RUN 15:57:58.5
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf22-cr.par
OUTPUT FILE NAME: pbf22-cr.out
==
                ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                        LIMITATION OF LIABILITY

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    DOE Field Office, Idaho, Contract Number DE-AC07-76ID01570.
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    Cambridge University Press.
==

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment   *
    *   of the groundwater pathway from the leaching   *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds   *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit   *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 Cr-III
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 6
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   7.00E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   7.00E+01

J- 717

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1)  0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)             2.80E+09
MOLECULAR WEIGHT (g/mole)                        5.20E+01
SOLUBILITY LIMIT (mg/L)                          1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)      1.00E+38
BULK DENSITY OF AQUIFER (g/cm**3)                1.90E+00
POROSITY OF AQUIFER                              1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)        1.20E+00
DISPERSIVITY X DIRECTION (m)                     9.00E+00
DISPERSIVITY Y DIRECTION (m)                     4.00E+00
DISPERSIVITY Z DIRECTION (m)                     4.00E-01
PORE VELOCITY  (m/y)                             5.70E+02
WELL SCREEN THICKNESS (m)                        1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)       3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)       0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)       0.00E+00
NON-CARCINOGENIC REFERENCE DOSE RfD (mg/kg/d)    1.00E+00
UNITS OF CONTAMINANT                             mg
```

INPUT DATA FILE CREATED BY: _____ DATE 9/7/96

INPUT DATA CHECKED BY: _____ DATE 6/24/96

```
LIMITING SOIL CONCENTRATION CALCULATION
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
***********************************************************
LEACH RATE CONSTANT (1/y)                  3.1643E-04
UNSATURATED PORE VELOCITY (m/y)            2.9155E-01
DECAY CONSTANT(S) (1/y)                    0.0000E+00
RETARDATION FACTOR(S) (SATURATED)          2.3800E+01
RETARDATION FACTOR (UNSATURATED)           3.0712E+02
SOLUBILITY LIMITED MASS (mg)               1.3393E+15
SOLUBILITY LIMITED ACTIVITY (Ci)           0.0000E+00
TRANSIT TIME IN UNSAT ZONE (years)         1.0914E+04
FRACTION DECAYED DURING UNSAT TRANSPORT    0.0000E+00

>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
***********************************************************
INTEGRATION TIME (years)          30
BODY WEIGHT (kg)                  7.000E+01
AVERAGING TIME (days)             1.095E+04
WATER INTAKE RATE (L/d)           2.000E+00
EXPOSURE FREQUENCY (days/year)    3.500E+02
EXPOSURE DURATION (years)         3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)   1.000E-06
CARCINOGENIC RISK CRITERIA        1.000E-07
HAZARD QUOTIENT                   1.000E-01

>>> RESULTS OF CALCULATIONS
***********************************************************
LIMITING GROUNDWATER CONCENTRATION (mg/L):    3.65E+00
MAXIMUM GROUNDWATER CONCENTRATION (mg/L):     1.42E-02
AVERAGE GROUNDWATER CONCENTRATION (mg/L):     1.33E-02
HAZARD QUOTIENT FOR INPUT MASS:               3.63E-04
PEAK TIME (y):                                1.092407E+04
LIMITING SOIL CONCENTRATION (mg/m**3):        6.067E+07
LIMITING SOIL CONCENTRATION (mg/kg):          4.045E+04
LIMITING INVENTORY IN SOIL (mg):              7.714E+11
EXECUTION TIME (seconds)                      1
```

OUTPUT FILE FOR PBF22 Cs-137

TIME OF RUN 15:56:20.1
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf22-cs.par
OUTPUT FILE NAME: pbf22-cs.out
===

     ****
     *   *
     *   This output was produced by the model: *
     *   *
     *   GWSCREEN   *
     *   Version Control Copy, Version 2.4a   *
     *   A semi-analytical model for the assessment   *
     *   of the groundwater pathway from the leaching   *
     *   of surficial and buried contamination and   *
     *   release of contaminants from percolation ponds   *
     *   02-28-95   *
     *   Arthur S. Rood   *
     *   Idaho National Engineering Laboratory   *
     *   EG&G Idaho Inc.   *
     *   Subsurface and Environmental Modeling Unit   *
     *   PO Box 1625   *
     *   Idaho Falls, Idaho 83415   *
     ****
>>> TITLE OF PROJECT:
PBF-22 Cs-137
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   2.80E+02
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   2.80E+02

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)            2.12E-01
MOLECULAR WEIGHT (g/mole)                      1.37E+02
SOLUBILITY LIMIT (mg/L)                        1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)    3.03E+01
BULK DENSITY OF AQUIFER (g/cm**3)              1.90E+00
POROSITY OF AQUIFER                            1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)      5.00E+02
DISPERSIVITY X DIRECTION (m)                   9.00E+00
DISPERSIVITY Y DIRECTION (m)                   4.00E+00
DISPERSIVITY Z DIRECTION (m)                   4.00E-01
PORE VELOCITY (m/y)                            5.70E+02
WELL SCREEN THICKNESS (m)                      1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)     3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)     0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)     0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)  3.16E+01
UNITS OF CONTAMINANT                           Ci
```

INPUT DATA FILE CREATED BY: _C. Wiebe_ DATE 6/7/96

INPUT DATA CHECKED BY: _C A Whitaker_ DATE 6/24/96

```
----------------------------------------------------------------
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   2.46E+00
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
****************************************************************
LEACH RATE CONSTANT (1/y)              7.9300E-05
UNSATURATED PORE VELOCITY (m/y)        2.9155E-01
DECAY CONSTANT(S) (1/y)                2.2876E-02
RETARDATION FACTOR(S) (SATURATED)      9.5010E+03
RETARDATION FACTOR (UNSATURATED)       1.2255E+03
SOLUBILITY LIMITED MASS (mg)           5.3443E+15
SOLUBILITY LIMITED ACTIVITY (Ci)       4.6063E+14
TRANSIT TIME IN UNSAT ZONE (years)     4.3548E+04
FRACTION DECAYED DURING UNSAT TRANSPORT 1.0000E+00
----------------------------------------------------------------
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
****************************************************************
INTEGRATION TIME (years)         30
BODY WEIGHT (kg)                 7.000E+01
AVERAGING TIME (days)            2.556E+04
WATER INTAKE RATE (L/d)          2.000E+00
EXPOSURE FREQUENCY (days/year)   3.500E+02
EXPOSURE DURATION (years)        3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)  1.000E-06
CARCINOGENIC RISK CRITERIA       1.000E-07
HAZARD QUOTIENT                  1.000E-01
----------------------------------------------------------------
>>> RESULTS OF CALCULATIONS
****************************************************************
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
MAXIMUM GW CONCENTRATION FOR MBR #1:       1.91-232 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:       1.87-232 Ci/L RISK = 1.24-226
MAXIMUM CARCINOGENIC RISK:                 1.24-226
LIMITING PARENT GROUNDWATER CONC. (Ci/L):  1.51E-13
PEAK TIME (y):                             4.359484E+04
LIMITING SOIL CONCENTRATION (Ci/m**3):     1.341+214
LIMITING SOIL CONCENTRATION (Ci/kg):       8.939+210
LIMITING INVENTORY IN SOIL (Ci):           1.705+218
LIMITING INVENTORY IN SOIL (mg):           1.978+219
SPECIFIC ACTIVITY (Ci/g):                  8.619E+01
NOTE: THE LIMITING SOIL CONCENTRATION OF  8.939+207 Ci/g
      EXCEEDS THE SPECIFIC ACTIVITY OF THE NUCLIDE.
WARNING !!! THE LIMITING SOIL MASS OF  1.978+219 mg
EXCEEDS THE SOLUBILITY LIMITED SOURCE MASS OF 5.344E+15 mg
EXECUTION TIME (seconds)      0
```

OUTPUT FILE FOR PBF22 Hg

TIME OF RUN 15:58:28.4
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf22-hg.par
OUTPUT FILE NAME: pbf22-hg.out
==
                ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                        LIMITATION OF LIABILITY

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment   *
    *   of the groundwater pathway from the leaching   *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds   *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit   *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 Hg
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 6
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   1.00E+02
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   1.00E+02

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)             2.10E+06
MOLECULAR WEIGHT (g/mole)                        2.01E+02
SOLUBILITY LIMIT (mg/L)                          1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)      1.00E+38
BULK DENSITY OF AQUIFER (g/cm**3)                1.90E+00
POROSITY OF AQUIFER                              1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)        1.00E+02
DISPERSIVITY X DIRECTION (m)                     9.00E+00
DISPERSIVITY Y DIRECTION (m)                     4.00E+00
DISPERSIVITY Z DIRECTION (m)                     4.00E-01
PORE VELOCITY (m/y)                              5.70E+02
WELL SCREEN THICKNESS (m)                        1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS       (m)      3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS       (m)      0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS       (m)      0.00E+00
NON-CARCINOGENIC REFERENCE DOSE RfD (mg/kg/d)    3.00E-04
UNITS OF CONTAMINANT                             mg
```

INPUT DATA FILE CREATED BY: _____ DATE 6/7 96

INPUT DATA CHECKED BY: _____ DATE 6/24/96

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LIMITING SOIL CONCENTRATION CALCULATION
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
**********************************************************
LEACH RATE CONSTANT (1/y)                  2.2172E-04
UNSATURATED PORE VELOCITY (m/y)            2.9155E-01
DECAY CONSTANT(S) (1/y)                    0.0000E+00
RETARDATION FACTOR(S) (SATURATED)          1.9010E+03
RETARDATION FACTOR (UNSATURATED)           4.3832E+02
SOLUBILITY LIMITED MASS (mg)               1.9115E+15
SOLUBILITY LIMITED ACTIVITY (Ci)           0.0000E+00
TRANSIT TIME IN UNSAT ZONE (years)         1.5576E+04
FRACTION DECAYED DURING UNSAT TRANSPORT    0.0000E+00
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
**********************************************************
INTEGRATION TIME (years)            30
BODY WEIGHT (kg)                    7.000E+01
AVERAGING TIME (days)               1.095E+04
WATER INTAKE RATE (L/d)             2.000E+00
EXPOSURE FREQUENCY (days/year)      3.500E+02
EXPOSURE DURATION (years)           3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)     1.000E-06
CARCINOGENIC RISK CRITERIA          1.000E-07
HAZARD QUOTIENT                     1.000E-01
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
**********************************************************
LIMITING GROUNDWATER CONCENTRATION (mg/L):    1.10E-03
MAXIMUM GROUNDWATER CONCENTRATION (mg/L):     6.78E-06
AVERAGE GROUNDWATER CONCENTRATION (mg/L):     6.78E-06
HAZARD QUOTIENT FOR INPUT MASS:               6.19E-04
PEAK TIME (y):                                1.605193E+04
LIMITING SOIL CONCENTRATION (mg/m**3):        2.664E+04
LIMITING SOIL CONCENTRATION (mg/kg):          1.776E+01
LIMITING INVENTORY IN SOIL (mg):              3.387E+08
EXECUTION TIME (seconds)                      0
```

OUTPUT FILE FOR PBF22 Pu-239

TIME OF RUN 16:00:38.7
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf22-pu.par
OUTPUT FILE NAME: pbf22-pu.out
==
==

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment   *
    *   of the groundwater pathway from the leaching   *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds   *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit   *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 Pu-239

SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   3
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   5.50E+02
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   5.50E+02
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00

```
INITIAL MASS OR ACTIVITY (mg or Ci)          3.81E-04
MOLECULAR WEIGHT (g/mole)                     2.39E+02
SOLUBILITY LIMIT (mg/L)                       1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)   2.41E+04 7.04E+08 3.73E+04 2.18E+01
BULK DENSITY OF AQUIFER (g/cm**3)             1.90E+00
POROSITY OF AQUIFER                           1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)     2.20E+01 0.00E+00 0.00E+00 0.00E+00
DISPERSIVITY X DIRECTION (m)                  9.00E+00
DISPERSIVITY Y DIRECTION (m)                  4.00E+00
DISPERSIVITY Z DIRECTION (m)                  4.00E-01
PORE VELOCITY  (m/y)                          5.70E+02
WELL SCREEN THICKNESS (m)                     1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)    3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)    0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)    0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci) 3.16E+02 4.52E+01 1.49E+02 3.52E+02
UNITS OF CONTAMINANT                          Ci

INPUT DATA FILE CREATED BY: _____ DATE 6/7/86

INPUT DATA CHECKED BY:      _____ DATE 6/24/86
```

```
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)  6.14E+00
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
************************************************************
LEACH RATE CONSTANT (1/y)               4.0387E-05
UNSATURATED PORE VELOCITY (m/y)         2.9155E-01
DECAY CONSTANT(S) (1/y)                 2.8761E-05 9.8458E-10 1.8583E-05 3.1796E-02
RETARDATION FACTOR(S) (SATURATED)       4.1900E+02 1.0000E+00 1.0000E+00 1.0000E+00
RETARDATION FACTOR (UNSATURATED)        2.4062E+03
SOLUBILITY LIMITED MASS (mg)            1.0493E+16
SOLUBILITY LIMITED ACTIVITY (Ci)        6.5183E+11
TRANSIT TIME IN UNSAT ZONE (years)      8.5506E+04
FRACTION DECAYED DURING UNSAT TRANSPORT  9.1450E-01
```

```
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
************************************************************
INTEGRATION TIME (years)          30
BODY WEIGHT (kg)                  7.000E+01
AVERAGING TIME (days)             2.556E+04
WATER INTAKE RATE (L/d)           2.000E+00
EXPOSURE FREQUENCY (days/year)    3.500E+02
EXPOSURE DURATION (years)         3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)   1.000E-06
CARCINOGENIC RISK CRITERIA        1.000E-07
HAZARD QUOTIENT                   1.000E-01
```

```
>>> RESULTS OF CALCULATIONS
************************************************************
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
DECAY-INGROWTH FACTORS: 8.5100E-02  3.1318E-05  1.9863E-05  1.9857E-05
NOTE: PROGENY CONCENTRATIONS ARE REPORTED AT THE TIME OF THE MAXIMUM PARENT CONCENTRATION
MAXIMUM GW CONCENTRATION FOR MBR #1:  2.09E-17 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:  2.09E-17 Ci/L RISK =  1.39E-10
MAXIMUM GW CONCENTRATION FOR MBR #2:  3.22E-18 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #2:  3.22E-18 Ci/L RISK =  3.06E-12
MAXIMUM GW CONCENTRATION FOR MBR #3:  2.04E-18 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #3:  2.04E-18 Ci/L RISK =  6.40E-12
MAXIMUM GW CONCENTRATION FOR MBR #4:  2.04E-18 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #4:  2.04E-18 Ci/L RISK =  1.51E-11
MAXIMUM CARCINOGENIC RISK:               1.63E-10
LIMITING PARENT GROUNDWATER CONC. (Ci/L):  1.28E-14
PEAK TIME (y):                           8.566805E+04
LIMITING SOIL CONCENTRATION (Ci/m**3):   1.837E-05
LIMITING SOIL CONCENTRATION (Ci/kg):     1.225E-08
LIMITING INVENTORY IN SOIL (Ci):         2.336E-01
LIMITING INVENTORY IN SOIL (mg):         3.760E+03
SPECIFIC ACTIVITY (Ci/g):                6.212E-02
EXECUTION TIME (seconds)                 2
```

OUTPUT FILE FOR PBF22 Sr-90

TIME OF RUN 15:57:37.3
DATE OF RUN 06/07/96
INPUT FILE NAME: pbf22-sr.par
OUTPUT FILE NAME: pbf22-sr.out
==

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment *
    *   of the groundwater pathway from the leaching *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 Sr-90
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   0
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   1.50E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   1.50E+01

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)            1.03E-01
MOLECULAR WEIGHT (g/mole)                      9.00E+01
SOLUBILITY LIMIT (mg/L)                        1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)    2.91E+01
BULK DENSITY OF AQUIFER (g/cm**3)              1.90E+00
POROSITY OF AQUIFER                            1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)      2.40E+01
DISPERSIVITY X DIRECTION (m)                   9.00E+00
DISPERSIVITY Y DIRECTION (m)                   4.00E+00
DISPERSIVITY Z DIRECTION (m)                   4.00E-01
PORE VELOCITY (m/y)                            5.70E+02
WELL SCREEN THICKNESS (m)                      1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS     (m)      3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS     (m)      0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS     (m)      0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)  5.59E+01
UNITS OF CONTAMINANT                           Ci

INPUT DATA FILE CREATED BY: _____ DATE 6/17/96

INPUT DATA CHECKED BY:      C A Whitaker   DATE 6/24/96


~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   7.53E-01
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
*********************************************************
LEACH RATE CONSTANT (1/y)               1.4592E-03
UNSATURATED PORE VELOCITY (m/y)         2.9155E-01
DECAY CONSTANT(S) (1/y)                 2.3819E-02
RETARDATION FACTOR(S) (SATURATED)       4.5700E+02
RETARDATION FACTOR (UNSATURATED)        6.6598E+01
SOLUBILITY LIMITED MASS (mg)            2.9043E+14
SOLUBILITY LIMITED ACTIVITY (Ci)        3.9676E+13
TRANSIT TIME IN UNSAT ZONE (years)      2.3665E+03
FRACTION DECAYED DURING UNSAT TRANSPORT  1.0000E+00

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
*********************************************************
INTEGRATION TIME (years)        30
BODY WEIGHT (kg)                7.000E+01
AVERAGING TIME (days)           2.556E+04
WATER INTAKE RATE (L/d)         2.000E+00
EXPOSURE FREQUENCY (days/year)  3.500E+02
EXPOSURE DURATION (years)       3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y) 1.000E-06
CARCINOGENIC RISK CRITERIA      1.000E-07
HAZARD QUOTIENT                 1.000E-01
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
*********************************************************
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
MAXIMUM GW CONCENTRATION FOR MBR #1:        1.93E-37 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:        1.84E-37 Ci/L RISK = 2.16E-31
MAXIMUM CARCINOGENIC RISK:                  2.16E-31
LIMITING PARENT GROUNDWATER CONC. (Ci/L):   8.52E-14
PEAK TIME (y):                              2.401493E+03
LIMITING SOIL CONCENTRATION (Ci/m**3):      3.744E+18
LIMITING SOIL CONCENTRATION (Ci/kg):        2.496E+15
LIMITING INVENTORY IN SOIL (Ci):            4.761E+22
LIMITING INVENTORY IN SOIL (mg):            3.485E+23
SPECIFIC ACTIVITY (Ci/g):                   1.366E+02
NOTE: THE LIMITING SOIL CONCENTRATION OF 2.496E+12 Ci/g
      EXCEEDS THE SPECIFIC ACTIVITY OF THE NUCLIDE.
WARNING !!! THE LIMITING SOIL MASS OF 3.485E+23 mg
EXCEEDS THE SOLUBILITY LIMITED SOURCE MASS OF 2.904E+14 mg
EXECUTION TIME (seconds)      0
```

OUTPUT FILE FOR PBF22 U-234

TIME OF RUN 10:34:18.6
DATE OF RUN 06/10/96
INPUT FILE NAME: pbf22-u4.par
OUTPUT FILE NAME: pbf22-u4.out
===
                ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                        LIMITATION OF LIABILITY

===

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment *
    *   of the groundwater pathway from the leaching *
    *   of surficial and buried contamination and   *
    *   release of contaminants from percolation ponds *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 U-234
_____
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   2
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   3.50E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   3.50E+01

```
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1)  0.00E+00
INITIAL MASS OR ACTIVITY (mg or Ci)             5.44E-02
MOLECULAR WEIGHT (g/mole)                       2.34E+02
SOLUBILITY LIMIT (mg/L)                         1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)     2.45E+05 7.70E+04 1.60E+03
BULK DENSITY OF AQUIFER (g/cm**3)               1.90E+00
POROSITY OF AQUIFER                             1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)       6.00E+00 0.00E+00 0.00E+00
DISPERSIVITY X DIRECTION (m)                    9.00E+00
DISPERSIVITY Y DIRECTION (m)                    4.00E+00
DISPERSIVITY Z DIRECTION (m)                    4.00E-01
PORE VELOCITY (m/y)                             5.70E+02
WELL SCREEN THICKNESS (m)                       1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)      3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)      0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)      0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)   4.44E+01 3.75E+01 2.95E+02
UNITS OF CONTAMINANT                            Ci

INPUT DATA FILE CREATED BY: _____ DATE 6/19/96

INPUT DATA CHECKED BY:      _____ DATE 6/24/96


~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   8.71E+03
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
**********************************************************
LEACH RATE CONSTANT (1/y)              6.3080E-04
UNSATURATED PORE VELOCITY (m/y)        2.9155E-01
DECAY CONSTANT(S) (1/y)                2.8292E-06 9.0019E-06 4.3322E-04
RETARDATION FACTOR(S) (SATURATED)      1.1500E+02 1.0000E+00 1.0000E+00
RETARDATION FACTOR (UNSATURATED)       1.5406E+02
SOLUBILITY LIMITED MASS (mg)           6.7185E+14
SOLUBILITY LIMITED ACTIVITY (Ci)       4.1929E+09
TRANSIT TIME IN UNSAT ZONE (years)     5.4745E+03
FRACTION DECAYED DURING UNSAT TRANSPORT 1.5369E-02

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
**********************************************************
INTEGRATION TIME (years)         30
BODY WEIGHT (kg)                 7.000E+01
AVERAGING TIME (days)            2.556E+04
WATER INTAKE RATE (L/d)          2.000E+00
EXPOSURE FREQUENCY (days/year)   3.500E+02
EXPOSURE DURATION (years)        3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)  1.000E-06
CARCINOGENIC RISK CRITERIA       1.000E-07
HAZARD QUOTIENT                  1.000E-01
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
**********************************************************
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
DECAY-INGROWTH FACTORS: 9.8452E-01  4.8055E-02  3.0004E-02
NOTE: PROGENY CONCENTRATIONS ARE REPORTED AT THE TIME OF THE MAXIMUM PARENT CONCENTRATION
MAXIMUM GW CONCENTRATION FOR MBR #1: 5.30E-13 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1: 5.27E-13 Ci/L RISK =  4.91E-07
MAXIMUM GW CONCENTRATION FOR MBR #2: 2.97E-12 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #2: 2.96E-12 Ci/L RISK =  2.33E-06
MAXIMUM GW CONCENTRATION FOR MBR #3: 1.86E-12 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #3: 1.85E-12 Ci/L RISK =  1.14E-05
MAXIMUM CARCINOGENIC RISK:                 1.43E-05
LIMITING PARENT GROUNDWATER CONC. (Ci/L):  3.69E-15
PEAK TIME (y):                             5.515079E+03
LIMITING SOIL CONCENTRATION (Ci/m**3):     2.997E-08
LIMITING SOIL CONCENTRATION (Ci/kg):       1.998E-11
LIMITING INVENTORY IN SOIL (Ci):           3.811E-04
LIMITING INVENTORY IN SOIL (mg):           6.106E+01
SPECIFIC ACTIVITY (Ci/g):                  6.241E-03
EXECUTION TIME (seconds)       1
```

OUTPUT FILE FOR PBF22 U-238

TIME OF RUN 10:35:07.3
DATE OF RUN 06/10/96
INPUT FILE NAME: pbf22-u8.par
OUTPUT FILE NAME: pbf22-u8.out
===
                ACKNOWLEDGEMENT OF GOVERNMENT SPONSORSHIP AND
                         LIMITATION OF LIABILITY

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Energy, Office of Environmental Restoration and Waste Management,
DOE Field Office, Idaho, Contract Number DE-AC07-76ID01570.
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Cambridge University Press.
===

    ****
    *   *
    *   This output was produced by the model: *
    *   *
    *   GWSCREEN   *
    *   Version Control Copy, Version 2.4a   *
    *   A semi-analytical model for the assessment *
    *   of the groundwater pathway from the leaching *
    *   of surficial and buried contamination and *
    *   release of contaminants from percolation ponds *
    *   02-28-95   *
    *   Arthur S. Rood   *
    *   Idaho National Engineering Laboratory   *
    *   EG&G Idaho Inc.   *
    *   Subsurface and Environmental Modeling Unit *
    *   PO Box 1625   *
    *   Idaho Falls, Idaho 83415   *
    ****
>>> TITLE OF PROJECT:
PBF-22 U-238
~~~~~~
SIMPSON RULE SOLUTION
JSTART = 6
JMAX = 12
EPS =   5.0000E-03
MODEL OPTIONS
IMODE: 2
KFLAG: 1 (0)CONC VS TIME; (1)PEAK CONC AND LIMITING SOIL CONC
IMODEL:1 (1) SURF OR BURIED SOURCE; (2)POND SOURCE; (3) TABULATED SOURCE FUNCTION
ITYPE:0 (0) VERT AVG; (1) NON-VERT AVG; (2) AVG FROM 0 TO ZD
>>> INPUT DATA
****
NUMBER OF RADIOACTIVE PROGENY   3
LENGTH OF SOURCE PARALLEL TO GW FLOW (m)   6.51E+01
WIDTH OF SOURCE PERPENDICULAR TO GW FLOW (m)   6.51E+01
THICKNESS OF SOURCE (m)   3.00E+00
PERCOLATION RATE (darcy vel m/y)   1.00E-01
VOLUMETRIC WATER CONTENT IN SOURCE   3.43E-01
VOLUMETRIC WATER CONTENT IN UNSATURATED ZONE   3.43E-01
BULK DENSITY AT SOURCE (g/cm**3)   1.50E+00
SORPTION COEFFICIENT AT SOURCE (ml/g)   3.50E+01
BULK DENSITY IN UNSAT ZONE (g/cm**3)   1.50E+00
UNSATURATED ZONE THICKNESS (m)   1.04E+01
SORPTION COEFFICIENT IN UNSAT ZONE (ml/g)   3.50E+01
OPTIONAL LOSS RATE CONSTANT FOR SOURCE (y**-1) 0.00E+00

```
INITIAL MASS OR ACTIVITY (mg or Ci)           2.29E-02
MOLECULAR WEIGHT (g/mole)                      2.38E+02
SOLUBILITY LIMIT (mg/L)                        1.00E+06
HALF-LIFE(S) OF CONTAMINANT AND PROGENY (y)    4.47E+09 2.45E+05 7.70E+04 1.60E+03
BULK DENSITY OF AQUIFER (g/cm**3)              1.90E+00
POROSITY OF AQUIFER                            1.00E-01
SORPTION COEFFICIENT(S) IN AQUIFER (ml/g)      6.00E+00 0.00E+00 0.00E+00 0.00E+00
DISPERSIVITY X DIRECTION (m)                   9.00E+00
DISPERSIVITY Y DIRECTION (m)                   4.00E+00
DISPERSIVITY Z DIRECTION (m)                   4.00E-01
PORE VELOCITY  (m/y)                           5.70E+02
WELL SCREEN THICKNESS (m)                      1.50E+01
DISTANCE TO RECEPTOR ALONG X AXIS      (m)     3.25E+01
DISTANCE TO RECEPTOR ALONG Y AXIS      (m)     0.00E+00
DISTANCE TO RECEPTOR ALONG Z AXIS      (m)     0.00E+00
RADIOLOGICAL CARCINOGENIC SLOPE FACTOR (1/Ci)  4.27E+01 4.41E+01 3.75E+01 2.95E+02
UNITS OF CONTAMINANT                           Ci
```

INPUT DATA FILE CREATED BY: _~LL/'/ LL_ DATE 6/ 10/96

INPUT DATA CHECKED BY: _CA Whitiken_ DATE 6/24/96

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LIMITING SOIL CONCENTRATION CALCULATION
>>> INITIAL ACTIVITY CONVERTED TO MASS (mg)   6.81E+07
>>> VALUES CALCULATED IN SOURCE SUBROUTINE
*********************************************************
LEACH RATE CONSTANT (1/y)               6.3080E-04
UNSATURATED PORE VELOCITY (m/y)         2.9155E-01
DECAY CONSTANT(S) (1/y)                 1.5507E-10 2.8292E-06 9.0019E-06 4.3322E-04
RETARDATION FACTOR(S) (SATURATED)       1.1500E+02 1.0000E+00 1.0000E+00 1.0000E+00
RETARDATION FACTOR (UNSATURATED)        1.5406E+02
SOLUBILITY LIMITED MASS (mg)            6.7185E+14
SOLUBILITY LIMITED ACTIVITY (Ci)        2.2595E+05
TRANSIT TIME IN UNSAT ZONE (years)      5.4745E+03
FRACTION DECAYED DURING UNSAT TRANSPORT  8.4892E-07
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> EXPOSURE DATA FOR LIMITING SOIL CONCENTRATION
*********************************************************
INTEGRATION TIME (years)         30
BODY WEIGHT (kg)                 7.000E+01
AVERAGING TIME (days)            2.556E+04
WATER INTAKE RATE (L/d)          2.000E+00
EXPOSURE FREQUENCY (days/year)   3.500E+02
EXPOSURE DURATION (years)        3.000E+01
RADIOLOGICAL DOSE LIMIT (rem/y)  1.000E-06
CARCINOGENIC RISK CRITERIA       1.000E-07
HAZARD QUOTIENT                  1.000E-01
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
>>> RESULTS OF CALCULATIONS
*********************************************************
CARCINOGENIC RISK CALCULATION FOR RADIONUCLIDES
DECAY-INGROWTH FACTORS: 1.0000E+00  1.5482E-02  3.7900E-04  1.8306E-04
NOTE: PROGENY CONCENTRATIONS ARE REPORTED AT THE TIME OF THE MAXIMUM PARENT CONCENTRATION
MAXIMUM GW CONCENTRATION FOR MBR #1:  2.27E-13 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #1:  2.25E-13 Ci/L RISK =  2.02E-07
MAXIMUM GW CONCENTRATION FOR MBR #2:  4.04E-13 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #2:  4.01E-13 Ci/L RISK =  3.74E-07
MAXIMUM GW CONCENTRATION FOR MBR #3:  9.88E-15 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #3:  9.83E-15 Ci/L RISK =  7.74E-09
MAXIMUM GW CONCENTRATION FOR MBR #4:  4.77E-15 Ci/L
AVERAGE GW CONCENTRATION FOR MBR #4:  4.75E-15 Ci/L RISK =  2.94E-08
MAXIMUM CARCINOGENIC RISK:                  6.14E-07
LIMITING PARENT GROUNDWATER CONC. (Ci/L):   3.70E-14
PEAK TIME (y):                              5.515079E+03
LIMITING SOIL CONCENTRATION (Ci/m**3):      2.958E-07
LIMITING SOIL CONCENTRATION (Ci/kg):        1.972E-10
LIMITING INVENTORY IN SOIL (Ci):            3.761E-03
LIMITING INVENTORY IN SOIL (mg):            1.118E+07
SPECIFIC ACTIVITY (Ci/g):                   3.363E-07
EXECUTION TIME (seconds)     1
```